

TABLE E-6
BIRD TOXICITY REFERENCE VALUES

Constituent	Basis for Toxicity Reference Value (TRV)				TRV	Reference and Explanation ^d
	Duration and Endpoint ^a	Test Organism	Dose ^b	Uncertainty Factor ^c		
Dioxins and furans (Φg/kg BW/day)						
Total PCDDs	Chronic (119 days) no observed adverse effect level (NOAEL)	Ring-necked pheasant hen	0.01	1.0	0.01	Nosek, Craven, Sullivan, Hurley, and Peterson (1992). TRV based on toxicity of 2,3,7,8-TCDD.
Total PCDFs	Subchronic (21 days) lowest observed adverse effect level (LOAEL) (mortality)	1-day old chick	0.1	0.01 ^c	0.001	McKinney and others (1976).
Polycyclic aromatic hydrocarbons (PAH) (Φg/kg BW/day)						
Total high molecular weight (HMW) PAH		--	--	--	0.14	TRV based on toxicity of benzo(k)fluoranthene. If TRVs are not available for all HMW PAHs, this TRV should be used to assess potential risk of Total HMW PAH.
Benzo(a)pyrene	Acute median lethal dose (LD50)	Chicken embryo	300	0.01	3.0	Brunström, Broman, and Näf (1991).

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Benzo(a)anthracene	Acute LD50	Chicken embryo	79	0.01	0.79	Brunström, Broman, and Näf (1991).
Benzo(b)fluoranthene	--	--	--	--	0.14	No toxicity data available for benzo(b)fluoranthene. Benzo(k)fluoranthene used as surrogate.
Benzo(k)fluoranthene	Acute LD50	Chicken embryo	14	0.01	0.14	Brunström, Broman, and Näf (1991).
Chrysene	Acute LD50	Chicken embryo	100	0.01	1.0	Brunström, Broman, and Näf (1991).
Dibenz(a,h)anthracene	Acute LD50	Chicken embryo	39	0.01	0.39	Brunström, Broman, and Näf (1991).
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	Applicable TRV or surrogate not identified.
Polychlorinated biphenyls (PCB) (Φg/kg BW/day)						
Aroclor 1016	--	--	--	--	72	No toxicity data available. Aroclor 1254 TRV used as surrogate.
Aroclor 1254	Chronic (3 months) LOAEL (embryonic mortality)	Ring dove	720	0.1	72	Peakall, Lincer, and Bloom (1972). TRV based on toxicity of Aroclor 1254.
Nitroaromatics (Φg/kg BW/day)						
1,3-Dinitrobenzene	Acute LD50	Redwing blackbird	37.6	0.01	0.376	Schafer (1972).

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2,4-Dinitrotoluene	--	--	--	--	--	Applicable TRV or surrogate not identified.
2,6-Dinitrotoluene	--	--	--	--	--	Applicable TRV or surrogate not identified.
Nitrobenzene	--	--	--	--	--	Applicable TRV or surrogate not identified.
Pentachloronitrobenzene	Chronic (35 weeks) NOAEL	Chicken	7,070	1.0	7,070	Dunn and others (1979).
2,4,6-Trinitrotoluene	Subchronic (90 days) NOAEL	Northern bobwhite	7,000	0.01	70	Johnson and McAtee (2000). Benchmark value divided by an uncertainty factor of 100 in order to account for unknown intraclass variability and to extrapolate from a subchronic study.
Phthalate esters (Φg/kg BW/day)						
Bis(2-ethylhexyl)phthalate	Subchronic (4 weeks) NOAEL	Ringed dove	1,110	0.1	111	Peakall (1974).
Di-n-butyl phthalate	Chronic LOAEL (Reproductive effects)	Ringed dove eggs	1,100	0.01	11	Peakall (1974), as cited in Sample and others (1996). Benchmark value divided by an uncertainty factor of 100 in order to account for unknown intraclass variability and to extrapolate from a LOAEL.
Diethyl phthalate	--	--	--	--	--	Applicable TRV or surrogate not identified.

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Di(n)octyl phthalate	--	--	--	--	--	Applicable TRV or surrogate not identified.
Volatile organic compounds (Φg/kg BW/day)						
Acetone	Acute (5 days) NOAEL	Coturnix quail	5,200,000	0.01 ^h	52,000	Hill and Camardese (1986).
Acrylonitrile	--	--	--	--	--	Applicable TRV or surrogate not identified.
Bromoform	--	--	--	--	--	Applicable TRV or surrogate not identified.
Chloroform	--	--	--	--	--	Applicable TRV or surrogate not identified.
Crotonaldehyde	--	--	--	--	--	Applicable TRV or surrogate not identified.
1,4-Dioxane	--	--	--	--	--	Applicable TRV or surrogate not identified.
Ethylbenzene	--	--	--	--	--	Applicable TRV or surrogate not identified.
Formaldehyde	--	--	--	--	--	Applicable TRV or surrogate not identified.
n-Hexane	--	--	--	--	--	Applicable TRV or surrogate not identified.
1,1,2,2-Tetrachloroethane	--	--	--	--	--	Applicable TRV or surrogate not identified.
Vinyl chloride	--	--	--	--	--	Applicable TRV or surrogate not identified.
Semi-volatile organic compounds (Φg/kg BW/day)						

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Benzoic acid	--	--	--	--	--	Applicable TRV or surrogate not identified.
Benzyl alcohol	--	--	--	--	--	Applicable TRV or surrogate not identified.
Inorganics (mg/kg BW/day)						
Aluminum	Acute (4 - days) NOAEL	Ringed Turtle Dove	281	0.01	2.81	Carriere, Fischer, Peakall, and Anghern (1986).
Antimony	--	--	--	--	--	Applicable TRV or surrogate not identified. Ridgeway and Karnofsky (1952) reported LD50 for doses to eggs, however, that value could not be converted to a dose based on post-hatching environmental exposure.
Arsenic	Chronic (7 months) NOAEL	Brown-headed cowbird	2.46	1.0	2.46	U.S. Fish and Wildlife Service (1969).
Barium	Subchronic (4 weeks) NOAEL	One day old chick	208.26	0.1	20.8	Johnson, Mehring, and Titus (1960).
Beryllium	--	--	--	--	--	Applicable TRV or surrogate not identified.

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Boron	Chronic NOAEL (Reduced egg fertility and duckling growth, increased embryo and duckling mortality)	Mallard duck	28,800	0.1	2,880	Smith and Anders (1989), as cited in Sample and others (1996). Benchmark value divided by an uncertainty factor of 10 in order to account for unknown intraclass variability.
Cadmium	Chronic (90 days) NOAEL	Mallard drake	11.3	1.0	11.3	White and Finley (1978).
Chromium (hexavalent)	Chronic (5 months) NOAEL	Black duck	1.0	1.0	1.0	Haseltine and others (unpublished data). TRV based on trivalent chromium.
Copper	Subchronic (10 weeks) NOAEL	1-day old chicks	46.97	0.1	4.7	Mehring and others (1960).
Total Cyanide	Acute LD50	American kestrel	4	0.01	0.04	Wiemeyer, Hill, Carpenter, and Krynitsky (1986). Sodium cyanide is used as a surrogate for total cyanides.

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Lead	Acute (7 days) LOAEL (tissue lead levels)	Ringed turtle dove	25	0.01	0.25	Kendall and Scanlon (1982).
Mercury	Acute (5 days) LOAEL (mortality)	Coturnix quail	325	0.01	3.25	Hill and Camardese (1986).
Methyl mercury	Chronic (3 generations) LOAEL (mortality)	Mallard	0.064	0.1	0.0064	Heinz (1979).
Nickel	Subchronic (5 days) NOAEL	Coturnix quail	650	0.1	65	Hill and Camardese (1986) .
Selenium	Chronic (78 days) NOAEL	Mallard	0.5	1.0	0.5	Heinz and others (1987).
Silver	Subchronic (14 days) NOAEL	Mallard	1,780	0.1	178	U.S. EPA (1997).
Thallium	Acute LD50	Starling	35	0.01	0.35	Schafer (1972).

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Zinc	Chronic (44 weeks) NOAEL	Leghorn hen and New Hampshire rooster	130.9	1.0	130.9	Stahl, Greger, and Cook (1990).
Other compounds (Φg/kg BW/day)						
Cyclotrinitramine-methylene (RDX)	--	--	--	--	--	Applicable TRV or surrogate not identified.
Decane	--	--	--	--	--	Applicable TRV or surrogate not identified.
GB (Sarin)	--	--	--	--	--	Applicable TRV or surrogate not identified.
VX	--	--	--	--	--	Applicable TRV or surrogate not identified.
Sulfur mustard	--	--	--	--	--	Applicable TRV or surrogate not identified.

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Notes:

- a The duration of exposure is defined as chronic if it represents about 10 percent or more of the test animal's lifetime expectancy. Acute exposures represent single exposure or multiple exposures occurring within about two weeks or less. Subchronic exposures are defined as multiple exposures occurring for less than 10 percent of the test animal's lifetime expectancy but more than 2 weeks.
- b Reported value which were dose in diet or water were converted to dose based on body weight and intake rate using Opresko, Sample, and Suter (1996).
- c Uncertainty factors are used to extrapolate a reported toxicity value to a chronic NOAEL TRV. The TRV was calculated by multiplying the regulatory or reported toxicity value by the uncertainty factor.
- d The references refer to the study or studies from which the endpoint and doses were identified. Complete reference citations are provided at the end of this appendix.
- e Best professional judgement used to identify uncertainty factor. Factors evaluated include test duration, ecological relevance of endpoint, experimental design, and availability of toxicity data.